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(54) AN UPHOLSTERY CUSHION WITH A TEXTILE COVERING AND A FOAM CORE AND A PROCESS FOR ITS PRODUCTION

(71) We, BAYER AKTIENGESELLSCHAFT, a body corporate organised under the Laws of Germany of 509 Leverkusen, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an upholstery cushion (for use in seats) consisting of a textile covering backed by sealing layer and a core of foam material, and to a process for its production.

It is known that seamless textile coatings can be made by hot-forming textile sheet structures. Unfortunately, this process is not suitable for the production of coverings for cushions. This is because the forming operation causes the textile sheet structure to undergo greatest extension at those edges which will normally be the most heavily stressed when the cushion is in use. Furthermore, by filling a hollow stable moulding with foam one cannot make an aesthetically satisfactory seat which does not crease under load.

It is known in principle that textile coverings can be draped under suction over a vacuum foaming mould and then back-foamed. Conventional textile fabrics cannot be used with complicated moulds which have features e.g. beading which will lead to local heavy distortion. The connection between the warp and weft threads would be distorted at the particularly highly stretched edges to such an extent that the foam core would show through. It is known that textile sheet structures of this kind can be back-sealed. Unfortunately, the seal applied has the disadvantage that it tends to split open if excessive stressing occurs, thus forming openings through which the foaming mixture can escape. Another disadvantage is that the foamable mixture collapses in known manner in the vicinity of the fibres of the textile fabric and only reacts to completion after the interior of the foam core has already been formed. This produces the known phenomenon of a harder peripheral zone of the foam core. Quite apart from this, residues of the mixture can penerate through to the wall of the mould, making the visible surface of the textile fabric unsightly in appearance.

If there is no firm bond between the sealing layer and the soft foam core, undesirable creases are formed under load.

The object of the invention is to provide a seat cushion by a new process which prevents the visible surface of the covering from being spoiled during production, prevents creases from being formed in the seat cushion under load and which of course allows rational production.

The invention provides an upholstery cushion comprising a textile outer cover which is a stretchable knitted fabric or a stretchable flocked fabric and adjacent to the said outer cover an elastomeric sealing layer, which is situated between the outer cover and the interior of the cushion, which interior is a core of foam material, which has been produced by foaming in a mould into which the textile outer cover and sealing layer had previously been introduced, the reaction mixture which produces the foam being chosen so that the reaction temperatures developed adjacent to the sealing layer are low enough to prevent the elasticity of the sealing layer and textile cover from being reduced.

By virtue of these features, the stretchable textile covering can be placed in a vacuum foaming mould and stretched in such a way that uniform elongation is obtained throughout and no weak zones are formed along the edges as a result of excessive elongation. This is only possible by using a stretchable knit fabric or flock fabric. By virtue of the fact that the sealing layer consists of

an elastomer which guarantees at least the necessary elongation, no tears can occur in the sealing layer with a result that no foam is able to penetrate through into the textile covering. Finally, the foam core is produced by introducing a mixture for a cold foam recipe. By using cold-hardening polyurethane foams of this kind, the stretchability of the elastomer film and of the textile covering is prevented from being adversely affected by the inevitable evolution of heat.

Receipes for cold foams such as these can be found for example in German Offenlegunsschrift No. 2,153,086 and British Patent Specification No. 1,162,517.

In a seat cushion made up in this way, the covering is stretched with sufficient tension over the foam core after release from the foaming mould so that no unsightly creases are formed under load. Crease formation is also prevented by virtue of the fact that a firm bond is present between the sealing layer and the foam core.

The knit fabric preferably consists of textured continuous yarns based on polyamide and/or polyester. These yarns satisfy the requirement of adequate elasticity coupled with optimum optical coverage of the foam core and shown outstanding abrasion resistance and a high affinity for sealing. These favourable properties are particularly noticeable in cases where the knit fabric is a double-surface circular knit or flat-knit fabric or a one-surface velour-like knit fabric or a single jersey fabric, optionally with fancy threads.

In cases where the textile fabric consists of a flock fabric, the sealing layer consists of an elastomeric film serving also as a carrier layer for an adhesive layer which has been stretched during flocking for forming the textile fabric, the flock (preferably based on polyamide and/or polyester and/or polyacrylonitrile) being anchored in the adhesive.

Stretching the elastomer film during flocking produces a high flock density which is necessary for giving the covering a dense, velvet-like appearance when it is situated under tension on the finished seat cushion. For this reason, the degree of stretching applied during flocking should at least correspond to that of the covering on the completed seat cushion.

The sealing layer preferably consists of a thermoplastic polyurethane elastomer or of a layer of plasticised polyvinyl chloride which is coated with a layer of polyurethane solution on the foam side, or of latices based on acrylic esters or methacrylic esters or their copolymers with vinyl compounds.

Materials of this kind guarantee the requisite stretching and density properties, coupled with effective adhesion to textile and foam. Coating can be carried out for example with a solution by methods known. Another possibility is to use a suitable granulate of thermoplastic elastomers which are applied to the textile on a melting calender.

In one particular embodiment, the sealing layer consists of a film. A film of this kind can be advantageously joined to the textile by flame-lamination.

One structural modification of the seat cushion which can be used is one in which a film of soft polyurethane foam is arranged between the textile coating and the film. The advantage of this film is that better service properties are obtained because, without the film of soft polyurethane foam, the sealing layer acts as a heat insulating layer and the covering tends to become heated, causing discomfort to the person using the seat.

The film of soft polyurethane foam is preferably joined both to the textile covering and to the film by flame lamination. A flame-laminated bond of this kind can be formed very easily in the case of continuous sheets converging into a laminated sheet from which the coverings are ultimately cut out.

The invention also provides a process for the production of such a cushion in which a vacuum mould is lined with the textile cover and sealing layer and the reaction mixture for the foam is introduced into the mould, allowed to foam up, and the cushion removed from the mould.

The novel features are as follows: (*a*) the textile covering is a stretchable knit fabric consisting of a double-surface circular-knit or flat-knit fabric or of a single surface velour-like knit fabric or of a single jersey fabric, optionally with fancy threads, consisting of continuous textured yarns based on polyamide and/or polyester, or a stretchable flock fabric consisting of an elastomer film based on polyurethane and/or polyvinyl chloride which, for flocking, has been stretched and flocked with fibres based on polyamide and/or polyester and/or polyacrylonitrile, coated in its stretched form with a thermoplastic polyurethane elastomer, a plasticised polyvinyl chloride backed with a layer of polyurethane solution, or with a latex based on acrylic esters of methacrylic esters or their copolymers with vinyl compounds, (*b*) the covering thus coated is placed in its stretched form in the vacuum foaming mould and then applied thereto under suction and (*c*) foamable polyurethane-forming mixture of a cold-foam recipe is introduced into and allowed to react to completion in the hollow space left.

This process provides for rational production completely satisfying the requirements made of the end product. In one particular embodiment of the process ac-

cording to the invention, the sealing layer is in the form of a film of a thermoplastic polyurethane elastomer, a plasticised polyvinyl chloride backed by a layer of polyurethane solution, or of a latex based on acrylic esters or methacrylic esters or copolymers thereof with vinyl compounds, applied to the back of the textile covering by flame lamination.

A film of soft foam is preferably placed between the textile covering and the film and joined both to the textile covering and to the film by flame lamination.

In modification of the process stages described above, the textile covering can alternatively be first of all placed in and applied under suction to the foaming mould and then sealed. However, this process does have certain disadvantages because it is more time consuming and also less reliable than the preparation of textile sheet structures from which the coverings are ultimately cut out.

The seat cushion according to the invention is shown in cross-section in the accompanying drawing and described by way of example in the following with reference to several embodiments. In the accompanying drawings:

Figure 1 diagrammatically illustrates a seat cushion in cross-section.

Figures 1 to 5 show detail A of Figure 1, but with a different structure of the seat cushion in each case.

In Figure 1, the seat cushion consists of a textile covering 1 and of a sealing layer 2 which joins the covering 1 to a soft foam core 3.

In Figure 2, the seat cushion consists of a knit fabric 21 of circular-knit velour. The basic material is textured polyester yarn of dtex 110 f 26. The pile thread consists of textured polyester of dtex 167 f 34. The weight amounts to 305 g/m². A sealing layer 22, consisting of a 20% solution of a polyurethane elastomer in dimethyl formamide, has been applied in two layers to the back of the knit fabric 21 by the reverse-coating process. This sealing layer 22 weighs 105 g/m², based on the solids content. The foam core 23 has been produced from a cold-hardening polyurethane recipe. This recipe consists of an organic polyol, an isocyanate, an expanding agent, a catalyst and a siloxane block copolymer as foam stabiliser.

In Figure 3, the knit fabric 31 has the same structure as that shown in Figure 2. A plasticised polyvinyl chloride film 32 is used as the sealing layer, being fixed to the knit fabric 31 by a flame-laminated joint 34. Its other side is provided with a coating 35 of polyurethane solution which joins the elastomer film 32 to the soft foam core 33. The joints 34 and 35 are not in the form of pronounced layers, but blend with one another from the knit fabric 31 to the film 32 and from the film 32 to the soft foam core 33.

In Figure 4, the textile covering 41 consists of a flocked fabric and the sealing layer consists of a thermoplastic polyurethane elastomer film 42 which is coated on top with a layer 46 of adhesion promoter in which flock fibres 47 are embedded. The soft foam core is denoted by the reference 43.

In Figure 5, the textile coating consists of a circular knit relief fabric 51. The basic material is made up of a textured polyamide-6 of denier dtex 100 f 9 plied twice. The relief consists of textured polyamide-6 of denier dtex 156 f 18. This fibre material has a weight per unit area of 308 g/m². A 2 mm thick polyether urethane foam film 59 is applied as intermediate layer by means of a flame-lamination bond 54. A 60 μ thick film 52 is fixed as sealing layer to the back of this foam film 59, again by a flame-lamination bond 54. This film has a Shore-A-hardness of 85. The laminate combination thus prepared is heated to 70°C. by an infra-red heater and, immediately afterwards, it sucked by vacuum into a corresponding vacuum foaming mould and fixed in this mould. The soft foam core 53 is also made from a cold-foam recipe. The vacuum applied to the foaming mould is maintained during the foaming and hardening operation. The finished seat cushion can be removed from the mould about 10 minutes after the reaction mixture has been introduced.

WHAT WE CLAIM IS:—

1. An upholstery cushion comprising a textile outer cover which is a stretchable knitted fabric or a stretchable flocked fabric and adjacent to the said outer cover an elastomeric sealing layer, which is situated between the outer cover and the interior of the cushion, which interior is a core of foam material, which has been produced by foaming in a mould into which the textile outer cover and sealing layer had previously been introduced, the reaction mixture which produces the foam being chosen so that the reacton temperatures developed adjacent to the sealing layer are low enough to prevent the elasticity of the sealing layer and textile cover from being reduced.

2. A cushion as claimed in Claim 1 in which the knitted fabric is made of knitted textured continuous polyamide and/or polyester yarns.

3. A cushion as claimed in Claim 1 or Claim 2 in which the reaction mixture used to form the foam is a "cold foam" recipe (as herein described).

4. A cushion as claimed in any of Claims

1 to 3 in which the knitted fabric is a single jersey fabric, or a knitted pile fabric having a pile on one side only.

5. A cushion as claimed in Claim 4 in which the knitted fabric contains fancy threads.

6. A cushion as claimed in any of Claims 1 to 5 in which the elastomeric sealing layer is a layer of thermoplastic polyurethane elastomer, a composite layer comprising a layer of plasticised polyvinyl chloride coated with polyurethane on the side adjacent to the foam, or a layer made from lactices of acrylate and/or methacrylate polymers or copolymers with vinyl compounds.

7. A cushion as claimed in any of Claims 1 to 6 in which a film of soft polyurethane foam is interposed between the sealing layer and the textile covering.

8. A cushion as claimed in Claim 7 in which the film of soft polyurethane foam has been flame bonded to the sealing layer and the textile covering.

9. A cushion as claimed in any of Claims 1 to 3 or 6 to 8 in which the sealing layer consists of an elastomeric film serving also as carrier layer for an adhesive layer which has been stretched during flocking for forming the textile fabric, the flock being anchored in the adhesive.

10. A cushion as claimed in Claim 1 substantially as herein described with reference to any one of the drawings.

11. A process for the production of a cushion as defined in any of Claims 1 to 10 in which a vacuum mould is lined with the textile cover and sealing layer and the reaction mixture for the foam is introduced into the mould, allowed to foam up, and the cushion removed from the mould.

12. A process as claimed in Claim 11 in which the textile cover and sealing layer are applied to the internal surface of the mould by suction.

13. A process as claimed in Claim 11 or Claim 12 in which the textile cover already carries the sealing layer before it is introduced into the mould.

14. A process as claimed in any of Claims 11 to 13 in which the textile cover and sealing layer are applied to the internal surface of the mould whilst in a stretched condition.

15. A process as claimed in Claim 11 substantially as herein described.

16. A cushion when produced by a process as claimed in any of Claims 11 to 15.

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1 SHEET This drawing is a reproduction of the Original on a reduced scale

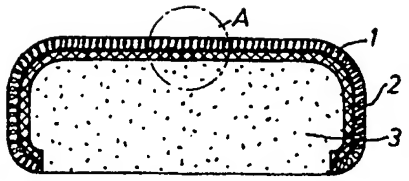

FIG. 1

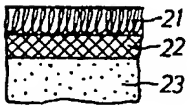

FIG. 2

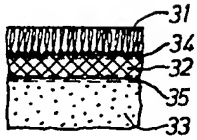

FIG. 3

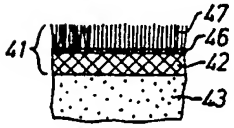

FIG. 4

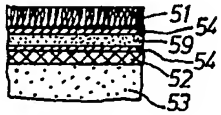

FIG 5